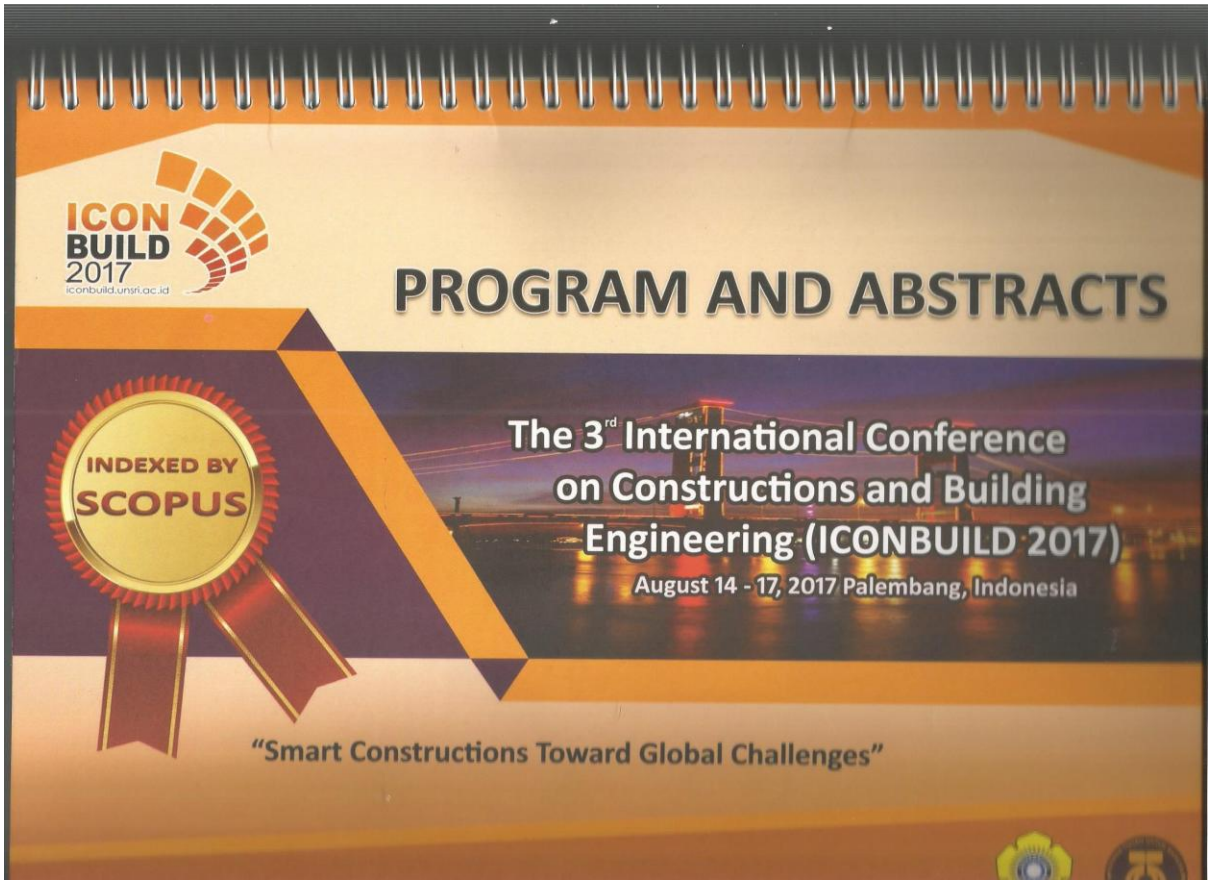
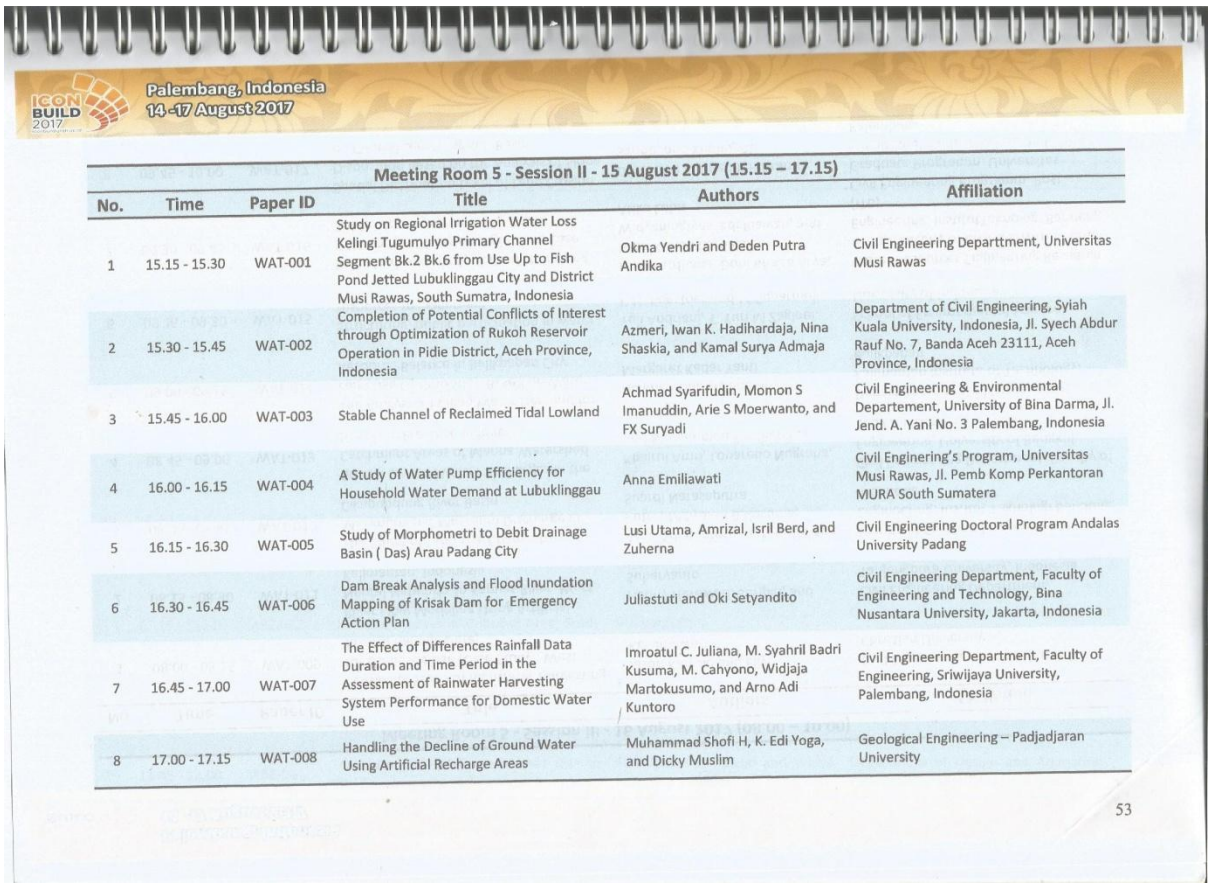




ICON BUILD 2017 Palembang, Indonesia 14 -17 August 2017

Meeting Room 5 - Session II - 15 August 2017 (15.15 – 17.15)

No.	Time	Paper ID	Title	Authors	Affiliation
1	15.15 - 15.30	WAT-001	Study on Regional Irrigation Water Loss Kelingi Tugumulyo Primary Channel Segment Bk.2 Bk.6 from Use Up to Fish Pond Jetted Lubuklinggau City and District Musi Rawas, South Sumatra, Indonesia	Okma Yendri and Deden Putra Andika	Civil Engineering Departtment, Universitas Musi Rawas
2	15.30 - 15.45	WAT-002	Completion of Potential Conflicts of Interest through Optimization of Rukoh Reservoir Operation in Pidie District, Aceh Province, Indonesia	Azmeri, Iwan K. Hadihardaja, Nina Shaskia, and Kamal Surya Admaja	Department of Civil Engineering, Syiah Kuala University, Indonesia, Jl. Syech Abdur Rauf No. 7, Banda Aceh 23111, Aceh Province, Indonesia
3	15.45 - 16.00	WAT-003	Stable Channel of Reclaimed Tidal Lowland	Achmad Syarifudin, Momon S Imanuddin, Arie S Moerwanto, and FX Suryadi	Civil Engineering & Environmental Departement, University of Bina Darma, Jl. Jend. A. Yani No. 3 Palembang, Indonesia
4	16.00 - 16.15	WAT-004	A Study of Water Pump Efficiency for Household Water Demand at Lubuklinggau	Anna Emiliawati	Civil Enginering's Program, Universitas Musi Rawas, Jl. Pemb Komp Perkantoran MURA South Sumatera
5	16.15 - 16.30	WAT-005	Study of Morphometri to Debit Drainage Basin (Das) Arau Padang City	Lusi Utama, Amrizal, Isril Berd, and Zuherna	Civil Engineering Doctoral Program Andalas University Padang
6	16.30 - 16.45	WAT-006	Dam Break Analysis and Flood Inundation Mapping of Krisak Dam for Emergency Action Plan	Juliastuti and Oki Setyandito	Civil Engineering Department, Faculty of Engineering and Technology, Bina Nusantara University, Jakarta, Indonesia
7	16.45 - 17.00	WAT-007	The Effect of Differences Rainfall Data Duration and Time Period in the Assessment of Rainwater Harvesting System Performance for Domestic Water Use	Imroatul C. Juliana, M. Syahril Badri Kusuma, M. Cahyono, Widjaja Martokusumo, and Arno Adi Kuntoro	Civil Engineering Department, Faculty of Engineering, Sriwijaya University, Palembang, Indonesia
8	17.00 - 17.15	WAT-008	Handling the Decline of Ground Water Using Artificial Recharge Areas	Muhammad Shofi H, K. Edi Yoga, and Dicky Muslim	Geological Engineering – Padjadjaran University

No. 5 Presentasi

(WAT-004)
A Study of Water Pump Efficiency for Household Water Demand at Lubuklinggau

Anna Emiliawati*

Civil Engineering Department, Engineering Faculty
Universitas Musi Rawas, Lubuklinggau, Indonesia
*Corresponding email: na_white221@yahoo.com

Water pump is a device to transport liquid from one place to another. This device is used in most of household in Indonesia. Small-scale water pump which is effective to lift more discharge is generally used. The ones that are most preferred are centrifugal types which having low absorbability. Pump performance is limited by pressure level in real electrical power whereas pump efficiency is influenced by head and discharge. The research aims to find out the efficiency of five distinct brands of home water pumps which are broadly distributed in market. Efficiency analysis take by laboratorium and financial analysis using NPV and BCR are done in order to obtained dicharge and pressure from each pump. At the end of the research, one out of 5 home water pump brands will be selected as the optimal working home water pump with low operational expense based on the utilizing age. The result of the research shows that the maximum efficiency value among various brands of water pump is diverse. Each value is arranged as follow from water pump A to E orderly: 12,922%, 13,485%, 12,823%, 14,751%, and 3,379%. From the calculation, water demand of South Lubuklinggau at stage 1 is 1117,730 l/s and stage 2 is 3495,230 l/s.. Moreover, the researcher conducts of investment, operation and maintenance cost with 25 years pump utilizing age towards 2 conditions (1) of maximum efficiency, i.e. pump A Rp 16.563.970,99; pump B Rp 12.163.798,00; pump C Rp 11.809.513,22; pump D Rp 11.473.928,32; pump E Rp 12.648.708,29; (2) of max discharge, i.e. pump A Rp 111.993.822,80; pump B Rp 26.128.845,51; pump C Rp 51.697.208,76; pump D Rp 51.098.687,44; pump E Rp 22.915.952,69; Financial analysis with interest rate 13% show a positive NPV(+) for all pump except pump A in max efficiency and a negative NPV (-) for all except pump B in max discharge. BCR value for max efficiency are pump A 0,813; pump B 1,622; pump C 1,705; pump D 1,689 and pump E 1,324. And for max discharge are pump A 0,197; pump B 1,063; pump C 0,661; pump D 0,654 and pump E 0,948. Result from that analysis obtained pump B are feasible with low cost and high benefit.

(WAT-005)
Study of Morphometri to Debit Drainage Basin (DAS) Arau Padang City

Lusi Utama[1,*], Amrizal[1], Isril Berd[1], and Zuherna[2]

[1]Andalas University, Padang, Indonesia
[2]Department of Civil Engineering, Engineering Faculty Bung Hatta University, Padang, Indonesia
*Corresponding email: lusi_utamaindo115@yahoo.co.id

High intensity rain that happened in Padang city cause the happening of floods at DAS Arau. Floods that happened in Padang besides caused high rain intensity, require to be by research about morphometri that is cause parameter the happening of floods. Morphometri drainage basin physical network (DAS) quantitatively related to DAS geomorphologi that is related to form of DAS, river network, closeness of stream, ramp, usage of farm, high and gradien steepness of river. Form DAS will influence rain concentration to outlet. Make an index to closeness of stream depict closeness of river stream at one particular DAS. Speed of river stream influenced by storey, level steepness of river. Steepness storey, level is comparison of difference height of river downstream and upstream. Ever greater of steepness of river stream, excelsior speed of river stream that way on the contrary. High to lower speed of river stream influence occurence of floods, more than anything else if when influenced by debit big. Usage of farm in glove its link to process of infitrasi where if geology type which is impermeabel, be difficult the happening of infiltrasi, this matter will enlarge value of run off. Research by descriptive qualitative that is about characteristic of DAS. Method the used is method survey with data collecting, in the form of rainfall data of year 2005 until year 2015 and Image of DEM IFSAR with resolution 5 metre, analyseduse Sofware ARGIS. Result of research got by DAS reside in at condition of floods gristle.

(WAT-006)
Dam Break Analysis and Flood Inundation Mapping of Krisak Dam for Emergency Action Plan

Juliastuti* and Oki Setyandito

Civil Engineering Department, Faculty of Engineering and Technology, Bina Nusantara University, Jakarta, Indonesia
*Corresponding email: juliastuti.juliastuti@gmail.com

Based on the Government Regulation of Indonesia number 27/PRT/M/2015 on Dam (which refers to the ICOLD Regulation (International Committee on Large Dam) : every dam required to have Emergency Action Plan (EAP), because the dams have a high risk in case of a dam break. The purpose of the EAP is to minimize the risk of loss of life and property which may be caused by dam failure which would cause flooding in downstream areas which have population higher than upstream areas.To make the EAP will require the analysis of dam the failure, where the analysis is carried out using numerical methods. The approaches of Dam collapse simulation are: 1. overtopping, 2. piping. Scenario Simulation based on overtopping is fracture quadrangular, triangular and trapezium where the fracture increasingly engorged with progressive time from the top down until it reaches the dam foundation. Scenario simulation based on piping will be simulated as cracks of orifice.The final results of the EAP is inundation map based on the time and flood depth. By knowing the inundation area, the risk due to the failure of a dam in the downstream area can be reduced. The other for risk management, the displacement map can also be made based on the areas that have the highest risk.

ICON BUILD 2017

The 3rd International Conference on Constructions and Building Engineering 2017

August 14 - 17, 2017

Palembang, Indonesia

Certificate of Appreciation

present to

LUSI UTAMA

in recognition and appreciation of your contribution as

PRESENTER

Executive Chairman

ICON BUILD 2017

Prof. Dr. Ir. H. Anis Saggaff, MSCE

Study of morphometry to debit drainage basin (DAS) arau Padang city

Lusi Utama, Amrizal, Isril Berd, and Zuherna

Citation: AIP Conference Proceedings **1903**, 100004 (2017);

View online: https://doi.org/10.1063/1.5011614

View Table of Contents: http://aip.scitation.org/toc/apc/1903/1

Published by the American Institute of Physics

Study of Morphometry to Debit Drainage Basin (DAS) Arau Padang City

Lusi Utama[1,a)], Amrizal[2], Isril Berd[3], Zuherna[4]

[1]*Students of Civil Engineering Doctoral Program Andalas University Padang*
[2,3]*Lecturer Department of Agriculture Andalas University*
[4]*Lecturer Department of Civil Engineering Bung Hatta University*

[a)]Corresponding author: lusi_utamaindo115@yahoo.co.id

Abstract. High intensity rain that happened in Padang city cause the happening of floods at DAS Arau. Floods that happened in Padang besides caused high rain intensity, require to be by research about morphometry that is cause parameter the happening of floods. Morphometry drainage basin physical network (DAS) quantitatively related to DAS geomorphology that is related to form of DAS, river network, closeness of stream, ramp, usage of farm, high and gradient steepness of river. Form DAS will influence rain concentration to outlet. Make an index to closeness of stream depict closeness of river stream at one particular DAS. Speed of river stream influenced by storey, level steepness of river. Steepness storey, level is comparison of difference height of river downstream and upstream. Ever greater of steepness of river stream, excelsior speed of river stream that way on the contrary. High to lower speed of river stream influence occurrence of floods, more than anything else if when influenced by debit big. Usage of farm in glove its link to process of infiltration where if geology type which is impermeable, be difficult the happening of infiltration, this matter will enlarge value of run off. Research by descriptive qualitative that is about characteristic of DAS. Method the used is method survey with data collecting, in the form of rainfall data of year 2005 until year 2015 and Image of DEM IFSAR with resolution 5 meter, analyzed use Software ARGIS. Result of research got by DAS reside in at condition of floods gristle.

PRELIMINARY

In line with going concern development process, needed by arrangement effort and guidance to activity's, with especial priority to re-create ecological balance of environment. Referring to problem of floods that happened [in Padang city that from year 2000, with high rain intensity will happened floods. Bar of Arau

represent Eldest River which there are in Padang city, not yet can overcome floods [6]. Like known that high rain intensity will cause the happening of floods. Cause of high rainfall intensity have done many its research. That floods not merely caused by rainfall but also caused by DAS morphometry [3] what consist of wide of DAS, form DAS, river network, closeness of stream, stream pattern, and Gradient steepness of river. For that influence of morphometry to DAS Arau require to be done research.

(a) (b)

FIGURE 1.(a). Headwaters bar picture of Arau, turn, full rock and vegetasi, (b). Area picture downstream full rock

STUDY LITERATURE

Parameter Crisis of Floods

According to [10], [13], [12], floods crisis parameters according to morphometry:

TABLE 1. Parameter floods and category

Parameter	Classification	Category	Score
Maximal Daily Rain (mm/day) Natural influence (35%)	<20	lower	1
	21-40	Rather low	2
	41-75	middle	3
	76-150	Rather high	4
	>150	High	5
Form of DAS	<0.2	ellipse	1
	0.21-0.40	Rather ellipse	2
	0.41-0.60	middle	3
	0.61-0.80	roundish	4
	>0.80	circular	5
Closeness of Drainage (km / km2) Natural Influence (5%)	<0.25	Seldom	1
	0.26-8.50	Rather seldom	2
	8.51-16.75	middle	3
	16.76-25	Rather meeting	4
	>25	meeting	5
Bevel (%) Natural Influence (5%)	>25	Very steep	1
	15-25	steep	2
	8-15	precipitous	3
	3-8	sloping	4
	0-3	Level off	5
Usage of farm Management (40%)	Cover forest	lower	1
	Forest production/plantation	Rather low	2
	Lawn/bush	middle	3
	Irrigated/non irrigated	Rather high	4
	Non irrigated/settlement	High	5
Gradient river Natural influence (10%)	< 0.5	lower	1
	0.5-1.0	Rather low	2
	1.1-1.5	middle	3
	1.6-2.0	Rather high	4
	>2.0	High	5
Form farm mountain Natural influence	Hilly	lower	1
	Rather hilly	Rather low	2
	Plain. terrace	middle	3
	Plain terrace (bevel <2%)	Rather high	4

	Plain of alluvial	High	5
High of pond (cm) Natural influence	<23	lower	1
	24-47	Rather low	2
	48-71	middle	3
	72-95	Rather high	4
	>96	High	5

Congeniality

[1], DAS morphometry represent quantitative size measure characteristic of DAS which related to aspect of geomorphology area. This characteristic related to rainwater process which fall in DAS. The Parameter wide of DAS, form DAS, river network, closeness of stream, stream pattern, and Gradient steepness of river. Drainage basin (DAS) left outspread area beside and and right the than a river stream, where all watercourse which there are on the right and is left of river have estuary into mains river. All rain that happened in a basin drainage, all its water will fill river which there are in DAS. On that account, DAS areal also represent rain capture area or referred as area catchment. All water emitting a stream of to pass river pull away river capture area (DAS) with or without reckoning gone through road; street before reaching run off, [9]. Drainage basin (DAS) also can be defined as a area limited by natural topography, where all rainwater which fall in it will emit a stream of to a exit and river outlet at river, or represent set of hydrology depicting and using set of physic-biology and set of economic social activity for the planning of and management of natural resources. [15]. Morphometry Drainage basin (DAS)] term used to express situation of network groove river quantitatively. Such situation for the analysis of river stream [7] for example covering:

Area of DAS

DAS represent place gathering of rain / precipitation to a river system. Wide of stream area can be estimated [5] with measuring the area ap of topography. Border line between DAS is contour back / surface of earth able to dissociate and divide rainwater to each DAS. The border line determined pursuant to change of contour of map of topography while wide its DAS can be measured by means of planimeter, used map scale will influence correctness of calculation

Wide and Long of DAS

Long of DAS [7] is equal to distance level off from river estuary up at pate upstream as long as Mains River. While is wide of DAS is comparison between wide of DAS with mains river length.

Gradient River

Gradient of river [7] can be obtained with the following equation:
Gradient = Vertical Distance / Horizontal distance

$$\text{Su}= \frac{h85-h10}{0.75\ Lb} x\ 100 \quad (1)$$

Closeness of drainage

Closeness of river [4] is an index number showing to the number of watercourse in a DAS. The Index obtained with the following equation:

$$\text{Dd} = \text{L/A} \quad (2)$$

Form Drainage basin

Pattern River determine form a DAS. Form DAS have important meaning in its link with river stream, that is having an effect on to speed of stream. According to [7], to determine form of DAS can know by determining assess its R.

$$\text{Rc} = 4\pi\text{A}/\text{P}^2 \quad (3)$$

Form of DAS influence rainwater concentration time emitting a stream of to go to outlet. Circular progressively form of DAS mean progressively shorten needed concentration time, so that floods fluctuation excelsior that happened. On the contrary ellipse progressively form of DAS, needed concentration time longer so that floods fluctuation progressively lower. Form of DAS quantitatively can be estimated by using long ratio value (' ratio' elongation / Re) and circularity ('ratio' circularity /Rc). Kinds of Drainage basin form: DAS in form of plumage, DAS in form of radial, DAS in form of is parallel.

River network

[13], River network can influence the level of river stream debit conducted by its river children. This parameter can be measured quantitatively from ramification ratio that is comparison between amounts of river path of ordo certain with river ordo one storey, level above him. This value indicate that ramification ratio excelsior mean the the river have many river children and fluctuation charge that happened ever greater also. River ordo is position ramification of river path in its sequence to river mains at one particular DAS. More and more amount of river order, progressively wide and long progressively also groove its river. River Ordo can be specified with method of Horton, Strahler, Shreve, and Scheidegger. But in general method of Strahler easier to be applied to be to be compared to the other method.

Daily rain maximum

Taken by rainfall data of year 2005 until year 2015

Classification Floods

Of floods crisis parameter got by floods classification based on score of divided variable like table 2, According to [10], [13], [12]:

TABLE 2. Classification floods

Classification	Score
Very gristle	40 – 29.4
Gristle	29.3 – 18.7
Not gristle	18.6 - 8

RESEARCH METHODOLOGY

Research conducted by descriptive qualitative that is about characteristic of DAS based on morphology at Arau debit. As for method taken is method survey by collecting data. Data aggregate later will be analyzed [2]. Research by using rainfall data of year 2005 up to year 2015. Rainfall calculated by Thiessen and get floods debit by using logarithm method of Pearson III [8]. Analysis of DAS relate at process use DEM and data operation of raster [12] to depict drainage basin and to get feature like river, river network, diffusion area, hollow. A big DAS can include, cover entire all river system in DAS, possible there is small river stream, one to each, every watercourse in stream system required data

1. Image of DEM IFSAR with resolution 5 meter. IFSAR with Single Use August 2011
2. Software ARGIS

Population is corps set of having same characteristic or assumed is same. This characteristic can be seen in the form of certain size measure [15]. Population can in the form of farm, which farm on the surface of earth very immeasurable. For that in this research of farm population better limit in the form of inclination of bevel, closeness of drainage, rainfall, farm form, use of farm, river Gradient, ordo, form DAS, and is high of pond.

RESULT AND DISCUSSION

Pursuant to result of calculation of Order river class and length based on map of Image, hence obtained result of rivers order class length and amount region of DAS Bar of Arau:

1. Wide of Bar of Arau 203,04 km2
2. Long of River of Arau 24,85 km
3. River Gradient:

$$Su = \frac{h85 - h10}{0.75Lb} \quad (4)$$

Su = Inclination of Especial Path River
h10 = Height of dot which lay in distance 0.10 Lb
h85 = Height of dot which lay in distance 0.85 Lb
Lb = Long of Especial Path River
h85 = 160 m
h10 =10 m
h85 - h10 = 160-10 = 150 m or 0.5 km
Su = 0.15 / 24.85 = 0.006036217 or 0.6036217 % (> 0.5 % rather low) (Score 2)

4. Bifurcation Ratio (Rb)

$$Rb = \frac{N_u}{N_u + 1} \quad (5)$$

Rb total =4.80 (ordo 5)

$$WRb = \frac{\sum \frac{Rb_u}{Rb_u + 1}(N_u + N_u + 1)}{N_u} \quad (6)$$

WRb = 9.62

5. Circularity Ratio (Rc)

$$Rc = \frac{4\pi A}{P^2} \quad (7)$$

A = 203.04 Km2
P = circle DAS = 98.19 km
Rc = $\frac{A}{Ac}$
Ac = πr^2
R = 15.63 km
Ac = 767.09 km
Rc = 0.26(Rather ellipse the including score 2)

6. Closeness Of drainage (Dd)
For total Length Mains river and watercourse of BatangArau 324.26Km^2
Closeness of drainage
Dd = L / a = 324.26 / 203.04
Dd = 1.60
Closeness of drainage= 1.60 (closeness class category rather seldom, score 2)

7. Frequency river order ratio (F)
Grand total of Ordo river = 263
Wide of DAS = 203.04 Km^2
Grand total of ordo river/wide of DAS (F) = 1.29

8. Bevel
Of biggest bevel 25 - 45% broadly 83.27 km^2
(Score 1, and 0 - 3% broadly 55.21km^2 (score 5).
Score bevel mean 3

9. Use of farm

TABLE 3. Use of farm

Use of farm	Area (Km^2)	SCORE
Forest	122.5	2
Garden	5.09	3
Farm	0.01	3
Empty farm	2.14	3
Settlement	50.58	5
Rice field	22.66	4
Coppice	3.7	3
Mean		3.28

10. Rainfall
    Of Station record rainfall: BatuBusuk, GunungNago, GunungSarik, LadangPadi and Simpang Alai daily rainfall maximum is 210 mm, including score 5
11. Form farm
    Farm form is form surface of earth representing floods determinant. Farm form which level off will be more be big floods crisis compared to hilly farm have, precipitous bevel:

TABLE 4. Form farm Arau

Form farm	Area (km^2)	Calculation	Score
Plain of aluvial	55.58	55.58/203.02 x 5 = 0.82	0.82
Terrace (bevel < 3%)	26.08	26.08/203.02 x 3 = 0.51	0.51
Lava and fan	37.31	37.31/203.02 x 2 = 0.37	0.37
Mountain	33.09	33.09/203.02 x 1 = 0.16	0.16
Hilly	50.96	50.96/203.02 x 1 = 0.25	0.25
	Total		2.11

12. High of pond
    R = 128.88 mm
    Wide area catchment (A) = 203.04 km2
    Inclination of River = S = 0.067
    Speed of stream (V) = 5.41 km / hour
    Concentration time (t) = 4.59 hour
    Rain intensity (I) = 28.08 mm / hour
    River Bar debit of Arau by using rational formula:

$$Q = 0.278CIA \quad (8)$$

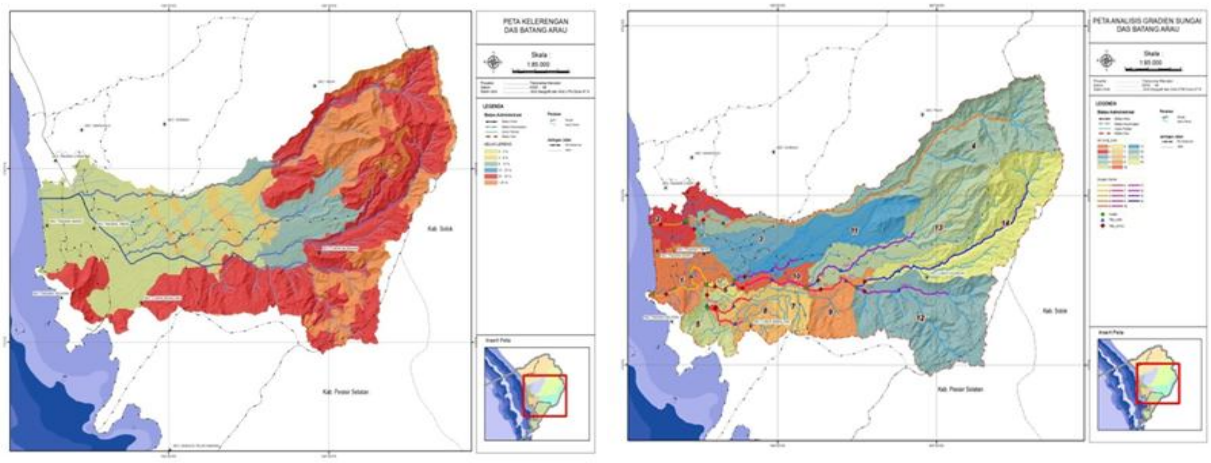
From analysis: debit of Arau Q = $317m^3$ / second wide mean 54 m, Bar depth of water of Arau = 2.06 m
Characteristic downstream in form of trapezium of A = (b + h) h x1/2
Angle inclination of river = 45^0.
P = circle wetly = $b + 2hV^2$
R = A / P
S = inclination of bar mean of Arau = 0.01
For the debit of Q = 317 m^3 / second, hence value of y = 0.85 meter, deepness of river mean = 2.06 meter, hence not happened floods middle area and Bar downstream of Arau. But low effect of depth of water him, speed of water Bar of Arau become to lower, so that happened sedimentation process (Score 4)

TABLE 5. Parameter of Morphometry floods

Parameter	Score	Total
Gradient = 0.6036217 % (low area)	2	
Rc = 0.26 (form of DAS) rather ellipse	2	
Closeness of drainage (Dd = 1.60) rather seldom	2	
Bevel (15%) precipitous	3	23.39
Usage of farm (middle)	3.28	Gristle floods
Rainfall (high)	5	Sedimentation
Form farm (rather low)	2.11	
High of pond (High)	4	

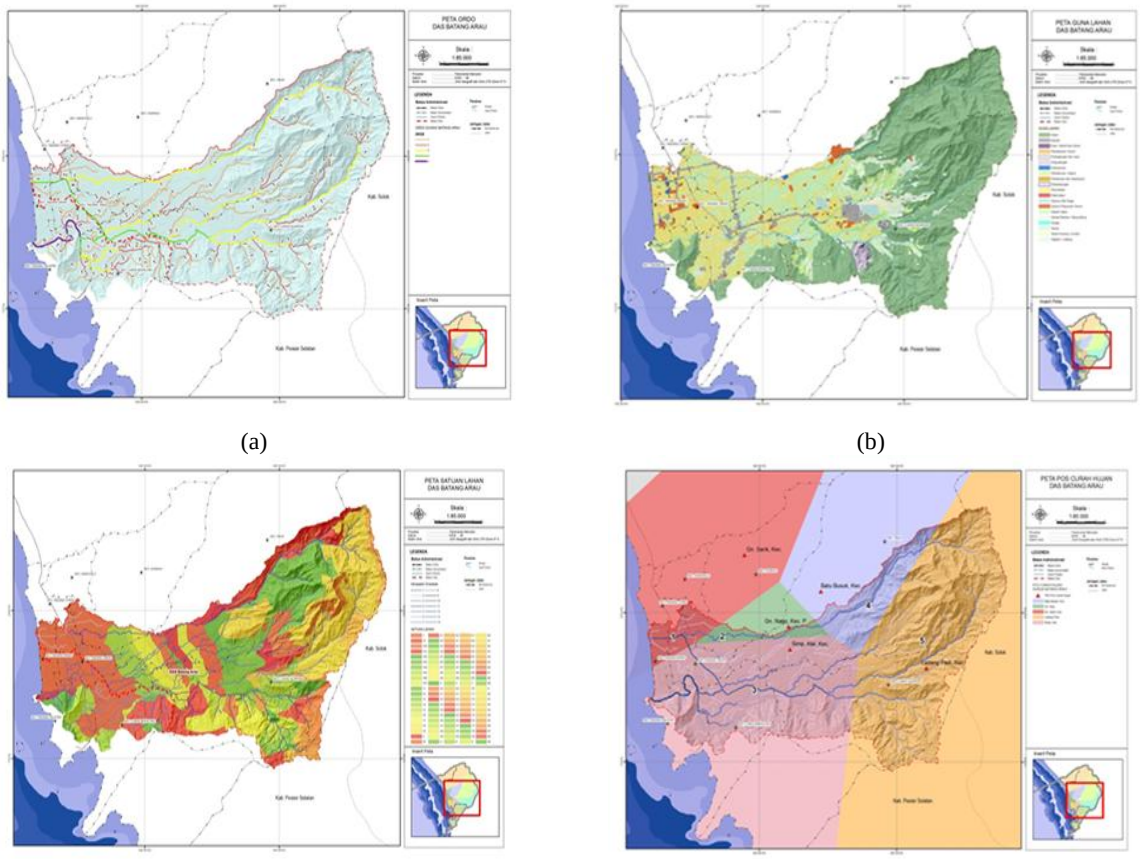
CONCLUSION

From eight (8) parameters of morphology cause of floods concluded that DAS Arau floods gristle and sedimentation gristle.



(a) (b)

FIGURE 2. (a) Map of Ramp, (b). Map of Inclination



(a) (b)

(c) (d)

FIGURE 3. (a). Map of Ordo, (b). Map of Usage of Farm, (c). Map Set of Farm, (d). Map of Rainfall Post

REFERENCES

1. Anonim, *MemahamiBencana*, (DepartemenKomunikasidanInformatikaRepublik Indonesia, Jakarta, 2008).
2. Arikunto, S. *ProsedurPenelitian* (BinaAksara, Jakarta, 2006).
3. Asdak C, *HidrologidanPengelolaan Daerah Aliran Sungai,* (GadjahMada University Press, Yogyakarta, 2002).
4. Dinaskimpraswil, Pedomanpenyusunanrehabilitasilahandankonservasitanah, (1986).
5. Hallaf, H.P., *Geomorfologi Sungai danPantai*, (Jurusangeografi FMIPA UNM, Makassar, 2005)
6. HarianSinggalang, *PencemaranBatangArau Kian Mengkhawatirkan* available at http://hariansinggalang.co.id. (2012).
7. Anonimous,*Geografi Kota Padang* available http://id.wikipedia.org. (2012).
8. JoesronLoebis, Soewarno, Suprihadi, *Hidrologi Sungai*, (DepartemenPekerjaanUmum, 2003)
9. Linsley RK, Kohler MA, PaulhusJLH.*HidrologiUntukInsinyur* (1982).
10. Mulyo, *PengetahuanGeologiuntukPemula*. (PustakaSetia, Bandung,2004).
11. Paimin, *TeknikMitigasiBanjirdan Tanah Longsor*, (BalaiPenelitianTeknologiKehutananPengelolaan DAS, Surakarta, 2009).
12. Rahayu. *BanjirdanUpayaPenanggulangannya*,(PusatMitigasiBencana (PMB-ITB), Bandung, 2009).
13. SitanalArsyad, *Bukutentangkonservasitanahdan air* (1989)
14. Soewarno,*Hidrologi: PengukurandanPengolahan Data Aliran Sungai (Hidrometri)*,(Nova, Bandung, 1991)
15. Suripin, *PelestarianSumberdaya Tanah dan Air*, (PenerbitAndiYogyakartaFakultasGeografi UGM, Yogyakarta, 2001)
16. Yunus, H.S., *Manajemen Kota PerspektifSpasial*, (PenerbitPustakaPelajar, Yogyakarta. 2005).